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THE

# LAW OF LONGEVITY.

With Special Reference to Life Insurance.

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The subject of longevity has always attracted much attention. The art and means of prolonging life were frequently made the themes of discussion, long before the real structure and functions of the most important organs in the human body were discovered. But as the principles of physiology have of late years become better understood, new interest has sprung up in relation to all matters pertaining to health, and the inquiry is very generally raised at the present time, what are the best means of preserving life, and thus securing that great boon, longevity? Now, may there not be a great general principle or law, grounded in physiology, which may serve as a guide in these matters, and help to illustrate and explain all minor facts or secondary considerations? Is there not some standard or model established by nature herself, to which we may always appeal, and by which all doubtful questions here may be tested? From our knowledge of the laws of nature, as well as of the principles of science generally, we should naturally infer that there must be found in physiology some such general law, or such standard. Several

years since, after somewhat extended observation, and no small amount of reflection and reading, I became convinced that there existed a great general law of population, or increase, as a fundamental principle in physiology, and that this same law of propagation (subject to certain conditions) extended throughout the whole animal and vegetable kingdoms. If such a law in nature does exist, it might be inferred that it would have some connection with the greatest amount of health and longevity.

**LAW OF PROPAGATION.**—This law may be briefly defined thus: it is based upon a perfect standard of organization, or consists in the perfectionism of structure; or, in other words, that every organ in the human body should be perfect in structure, and that each should perform its legitimate functions in harmony with others. Taking this, then, as a standard, we have a great law or principle pervading all organic matter, that furnishes a guide by which all deviations from this model, and the manifold changes that follow, may be explained and understood. While this law is subject to certain conditions, as food, climate, exercise, etc., all these act as secondary agents or factors. They may modify the operation of the law, but cannot change its nature or general character.

Evidences in proof of such a law may be deduced from physiology itself, from pathology, from the laws of hereditary descent, from the effects of intermarriage of relations, from facts gathered in the history of different families, and changes in numbers, as applied to distinct classes, races, and nations. But without dwelling upon these points, we maintain that the organization upon which this law of propagation is based, presents also the only true standard in physiology for the greatest amount of longevity—of health—of physical strength and happiness, as well as of beauty in form and outline.

**LAW OF LONGEVITY.**—But it is proposed to consider here only the application of this law to longevity. By this term is meant long life—the greatest duration of human life, whether in isolated cases or in large numbers. Where, then, are these cases found—what is their character—and what are the facts attending them?

In the first place, it is very evident that long life is not dependent alone upon food, nor upon climate, nor upon exercise ; neither is it found in any one locality, nor with any one people, nor in any particular station ; neither where great riches nor excessive poverty abound. It is sometimes found in the city, but more generally in the country.

All must admit that some of these conditions are very important, and that good health and long life must depend greatly upon the manner in which the relations between the various parts of the system and these external agents are carried on. But after all, may there not exist a general law in the body itself upon which these depend ? If we had perfect standards of organization around us upon which this law is based, its truth would be more easily demonstrated ; but instead of such, we have only approximations, and these in almost endless variety and form. In order that we may have a clearer and more definite understanding of the foundation of this law, let us carefully examine its physiological conditions. Every animal organization is complex—is composed of many distinct organs. Each organ has a specific work to do, and in its normal state must do so much and no more. Now in the healthiest and most perfectly organized structure, all these separate organs are found not only in a perfectly healthy condition—each one performing its own normal functions—but well balanced and working harmoniously together. In this state “the wear and tear,” or the demands which nature makes to support life and carry on its operations, come upon all these organs alike, each according to its own nature, without infringing upon that of any other.

**THE HUMAN BODY COMPARED TO A MACHINE.**—In the promotion of health and longevity, too much stress cannot be attached to the importance of preserving this harmony or balance of organization. In some respects, the human body may be compared to a perfect machine, made up of many complicated parts. How different the working or running of such a machine from that of one imperfectly constructed and unequally balanced in all its parts ! The one seldom needs repairs, the other frequently. The one will last as it were

for an age ; the other becomes almost useless in a short time.

It is so in reference to the human system. Whenever a certain organ or class of organs becomes relatively too large or too small, causing a want of balance or harmony in their action, there must be in the very nature of the case far greater liability to disease. Accordingly, it is in persons possessing this imperfect, ill-balanced organization, that we find not only the greatest amount of sickness, but that which is most obstinate and fatal. How often it happens that some slight derangement or trifling weakness operates as the entering wedge to the most serious diseases ! It is the weak spot caused by inheritance, or developed by exposure, where disease finds its germ or starting point, though all other parts of the system are in a perfectly sound condition ; and not unfrequently life is terminated by a single organ, or even some part of it giving out, when all the other organs might have performed their healthy functions for many years.

We dwell upon the importance of this harmony or balance of action in the vital forces, for it is the great secret of good health and long life. It is a cardinal point in the law of longevity, as will appear from a more full sketch of its foundation.

**PERFECT STRUCTURE AND HARMONY OF FUNCTION.**—It is upon this perfect structure or anatomy of the body, combined with the normal action of all its physiological functions, upon which we base this law of longevity. It is true we have no such perfect standards or models of human organization now existing, but only approximations towards them. Still the law may apply to such as we have, just as well as the general law of gravitation or attraction to the smallest-sized bodies. We can readily conceive of such standards, and how the same law that governs them may be applicable to their representatives of whatever grade or character.

All the pains, the weaknesses, and the diseases of the human body, are but the result of deviations from this normal state ; and all the means and agencies employed for the preservation of health and life look towards restoring this standard. It is

well known that there are influences constantly operating to produce changes both in the structure and functions of the system. Some of these agencies have their origin internally; some act entirely external to the body, and others operate by what are called laws of heredity. By some of these influences the physical system is improved and perfected, but by others the deviations from a healthy standard are increased more and more. Probably the most powerful of these forces is that of inheritance. This agency constitutes a very important element in the law of longevity. All writers upon this subject place this condition as first and foremost—that one of the almost indispensable requisitions for long life, is good healthy stock, or long-lived ancestry. For it has been found by universal observation and experience, that the representatives of such stock live the longest, and that very seldom, if ever, are found persons of great age originating from feeble and short-lived ancestry.

LAW OF INHERITANCE.—Now what is the secret of this transmitted power that conduces so much to longevity? May there not be some general principle or law involved in these changes from hereditary influences, which may aid us in explaining the why and wherefore? We know well the effects of such power, but what is the explanation—what is the philosophy involved? Under the law in nature that “like begets like,” and that when the producing forces are sound and healthy, it is found that their offspring will partake of the same character; and that under favorable circumstances, this may be continued for several generations. Sometimes there is an improvement in the stock; but not unfrequently a deterioration, especially after three or four generations.

Now what is the peculiarity or type of organization here perpetuated? What are its elements or constituents? What makes it long-lived? Do we not find that it consists in a sound, healthy structure of every part of the body, and that there is a remarkable balance in all the organs and harmony of functions? We venture the assertion that such will be found the character of this organization in every

instance, and that there are no exceptions to the rule. Does not this, then, afford evidence that there is a general law in nature conducive to longevity, and that this law is based upon that organization which is most perfect, and all of whose functions act most harmoniously? Let us apply the rule to such individuals and families reaching a great age, that have come under our own observation. For many years I have verified the fact in numerous cases, and have never found an exception.

There is another point of view whereby this law may be tested. Certain physiological conditions have been laid down by some writers as sure indications of longevity. These conditions embrace the healthy performance of the functions of all the leading organs of the body, and may be summed up under these heads: Respiration, Digestion, Circulation, Assimilation, and Secretion. Where all the vital forces connected with each of these departments of physiology are found to operate regularly and vigorously, they are thought to be the sure indications and precursors of longevity. Now what does this imply but soundness of structure and harmony of function? Let any one of these fail in the least of performing its part, and all suffer. Does not this view of longevity, then, furnish strong evidences in favor of the law which has been set forth in this paper?

**SIGNS OF LONGEVITY.**—There is another class of facts which has an important bearing upon this question. These are what are denominated the physical signs of longevity. There must be a symmetrical development of the whole body. The head must not be too large or too small. The neck must not be too long or too slender. The chest must be well developed, but the abdomen must not be too large. The whole body must be well proportioned, not too tall nor too short. No class of organs must be too predominant; or, in other words, the Temperaments must be properly mixed or blended, especially the Nervous and the Sanguine, possessing more of the vital organs, must not be very conspicuous. There are some minor signs, such as the voice, the teeth, the color of the eyes and the skin, the quality of organization, etc.; but

when we sum up all the foregoing signs, do they not clearly point to a harmony or balance of all the organs of the body, and thus confirm the truth of the law of longevity as here advocated?

There is a large body of facts also connected with the cure and prevention of disease, that has a direct bearing upon this subject. All sound medical treatment, and means for the promotion of health, operate in harmony with this great law of longevity. They aim to restore the normal structure and healthy functions of every part of the body.

In all works treating of longevity great stress is laid upon the influence of climate, food, air, water, exercise, etc. Statistics show that, while the extremes of either heat or cold are not conducive to long life, a moderate climate in countries where the changes of temperature are neither too great nor too sudden, is decidedly favorable. But even here there must be a strict observance of hygienic laws. In relation to the right kinds of food and drink, pure air, healthy localities, dwellings, employments, etc., however important, they are all secondary agencies, and operate under and in harmony with one great general law.

MENTAL HYGIENE.—But there is still another class of facts differing from any of those mentioned, that has a powerful influence upon longevity, viz., the influence of mind upon the body. Mental training, a well-balanced mind, a cheerful, contented disposition, and temperate habits are, with rare exceptions, found indispensable. Now these presuppose a harmonious development of the whole body, and particularly of all parts of the brain. For it is impossible, we believe, to obtain the qualities here mentioned in a high degree without these two conditions. And the nearer this development approaches that standard of organization upon which is based the great law of longevity, the greater will be not only the aggregate amount of health, but the longer the duration of human life. This statement will be found abundantly verified in the history and character of persons who have reached a great age.

This interdependence of body and mind is becoming every

year better and better understood. It is found that the relations of the mind to the body, and of the various states and changes of physical organization to the mind, have a powerful influence upon health. And the more marked and abnormal the differences in this relation, the more striking are the effects. If, then, health is so dependent upon the state and relation of these two agents, the duration of human life must be most sensibly affected by it. And we venture the assertion, that the more thoroughly this particular feature of the subject is investigated, the more important and far-reaching will be found the influence of these reciprocal relations. The evidences derived from this source will go far, we believe, towards proving that nature has established a certain harmony or equilibrium of action between the body and the mind, and the more perfect that development and harmonious the performance of their respective functions, the nearer is the approach to that standard of organization upon which is based the law of longevity.

This view explains, in part, why the average age of man has been increased by education, and that the greatest longevity is found among nations most highly civilized. In confirmation of this remark, a distinguished writer says: "That type of civilization in which the efficiency of the community and of the individual is greatest, in which there is the most harmonious action between the body and the mind, the greatest happiness of the greatest number, the least excessive expenditure with the least luxury, where regularity and temperateness are innate characteristics, will be that state of civilization most favorable to longevity." It is scarcely necessary to say that such a type of civilization could not exist without well developed physical organizations generally, and a harmonious action of all the mental faculties.

Another well known writer on this subject, after enumerating among the prerequisites to longevity, temperate and regular habits, a cheerful and contented disposition, says there must be not only an equilibrium of the mental faculties, but a descent from long-lived ancestors, a tranquil and happy temperament, and general symmetry of physical conformation,

and harmonious proportion of all the different parts and organs of the body.

Numerous quotations might be cited from other authors, and many additional facts might be gathered from various sources in support of this theory of longevity; but our present limits will not permit. Perhaps the theory of one writer should not be passed by unnoticed, inasmuch as it may be thought to have some resemblance to the one here presented.

**THEORY OF M. FLOURENS.**—M. Flourens, in a very elaborate Treatise, maintained that man ought by virtue of his natural constitution to live a hundred years, and that this natural term of life is abridged only by his own improvidence, follies and excesses. The length of human life he attempts to establish by the law of growth and by analogy, viz., that every animal will live, on an average, five times the period of his growth. Thus, as it is found by anatomy that it takes, on an average, twenty years for man to reach his perfect growth, especially the bony structure, the limit of life would be one hundred years. Flourens held that neither climate, nor food, nor race, nor any external condition had much to do with the duration of life, but this depended almost wholly upon the natural constitution, and the intrinsic vigor of all the organs of the body. But he does not define very clearly how this natural constitution is based upon the anatomy and physiology of the system, nor attempt to show what are its laws and relations to the external world. We all know that climate, food, and other external agents have a powerful influence upon the development and preservation of the body. One great defect in his theory is, that he does not point out distinctly the great laws of health and life as based on physiology and external nature, which extend not only through individual existence, but are universal throughout creation. As to the question what is the natural period of human life, provided all the conditions are favorable, perhaps he is not so much out of the way, though the testimony of most writers would place the limit somewhat less. Flourens presents us no standard of organization as a perfect model of imitation, and upon which the great laws of health and life

must be based. If we take into consideration the structure and functions of the human body—the design of its existence, and its adaptation to external objects,—there must be certain relations and fixed laws that govern in all these matters. For illustration, there is a fixed law that exists in the relation of pure air to the healthy functions of the lungs. It is so in reference to all other parts of the body. Now it is in the summing up of all these laws as applied to a perfect organization, that we find the law of longevity. All the great laws of nature that are fixed and universal are invariably found based upon her works in a normal state, or in their most perfect development. As in painting and statuary the artist has constantly in his mind an ideal model, a typical standard which no living beings have ever reached but only made approximations to, so in physiology it is easy to conceive of a standard which represents an organization in its highest state of development. It was with reference to the making up and arranging the constituent elements which enter into such a standard that led the most profound physiologist in our country, Prof. Draper, to make this remarkable statement: “The approach to precision in these hypothetical constants will in all times be a measure of the exactness of physiology, and, it may be added, also of the practice of medicine. The time is at hand when such a typical standard must be the starting point for pathology; and no rational practice can exist without it. The passage of physiology from a speculative to a positive science, is the signal for a revolution in the practice of medicine.”

**ADVANTAGES OF THE LAW OF LONGEVITY.**—The question may very properly be asked, supposing there is such a law of longevity, what are its advantages? We answer, many and great. It is not a mere speculative theory or vague hypothesis that cannot be comprehended or applied to any practical purpose. It harmonizes not only with all the well-known truths of physiology and pathology, but is sustained by all the agencies employed by nature or art for the protection and preservation of life. In fact, it is that great general law es-

tablished by the Creator himself for perfecting and prolonging the life of every human being, of which all minor laws are a part and parcel. It holds up before us that perfect form and image in which man was created, and presents an embodiment of those laws and conditions with which we must comply in order to secure the greatest amount of happiness and the longest duration of life. With such a standard constantly before us, shall we not make greater efforts to conform to it than if we had no such conception? Besides, by means of understanding the various deviations from this perfect standard, we obtain a better knowledge of the infirmities, the liabilities, and the weaknesses of the human system. It presents a new standpoint from which to survey the causes of disease, as well as the agencies employed for its cure and prevention. It gives us a clearer and better understanding of the principles of Hygiene and sanitary law, and enjoins the absolute necessity of observing them, if good health and long life are to be secured. It shows that all the changes which occur in the human system are subject to law; that disease, of whatever type and character, or wherever found, is a violation of law; and all treatment and remedies, whether provided by nature or art, must be viewed as agents, or means to repair the injury.

APPLIED TO LIFE INSURANCE.—But there is one use to which this law may be applied of incalculable value. We refer to Life Insurance. This is becoming an immense business, scarcely surpassed in interest and magnitude by that of any other in the country. From the best sources of information, it is estimated that there are over five hundred thousand or half a million of lives insured in over two hundred different companies, and the amounts invested and at risk would startle one not accustomed to figures. The largest proportion of this business has sprung up within twenty or thirty years, and what is singular, the larger the business and the wider its expansion, the greater the changes in its management, and the more uncertain are its results. We should naturally suppose that time and experience would give permanence and stability; but what a sad spectacle is presented by the

rise and fall of so many Life Insurance companies as have occurred—some of them, too, after many years apparently of successful experience! What a history of wrecks, losses and disappointments does it exhibit! Scarcely can a parallel be found in the history of any other incorporated business in the country.

Commencing more than thirty years ago as an examiner for Life Insurance, appointed by the London Loan Office, and having since been connected as an examiner with several other companies, I have become more and more convinced that there was here room for great reform. But there are some questions on this subject of great interest, which we cannot now discuss, but which, under other circumstances, might claim attention; our present object is simply to show wherein this law of longevity may be applied with great success to Life Insurance.

In the examination of any organic structure with reference to forming an estimate of its continuance, we must understand correctly its nature and construction, as well as the laws that govern its action. If it is made up of many parts or distinct organs, we must comprehend fully their relations to each other and to external objects. But in order to make the best use of such knowledge, and form an intelligent estimate of results, we want some general law or standard of appeal, which shall be applicable to the whole. To any one acquainted with the earlier history of the different sciences, it is well known what great advantage was found when a large body of facts or amount of knowledge had been obtained, that by the discovery of a general principle all these facts and this knowledge could be more systematically arranged, and satisfactorily explained. It is somewhat so in applying this law of longevity to life insurance, though it may be subject to many conditions, and cannot be reduced to mathematical accuracy.

**PREREQUISITES OF LONGEVITY.**—Without explaining again this law and its conditions, let us briefly notice some of its applications in determining the prospect or continuance of life. All the essential elements or prerequisites for longevity may be conveniently arranged or summed up under three dis-

tinct heads, viz., *constitution, inheritance, and obedience to law.*

1st. It furnishes the examiner for life insurance with a standard of organization, with which the constitution of all persons examined may be compared, and which will assist in forming a correct judgment of their soundness, or in detecting the physical deviations from a normal standard ; then what are the liabilities to disease, and what the prospects or probabilities of life. Without such a standard or guide we have no general rule to test the soundness or strength of the constitution. It must depend very much upon opinion merely, which, of course, will vary according to the differences of judgment in different individuals. With such a model constantly before us as nature has furnished, we can understand more exactly and fully the relations which all parts or organs of the body sustain, one to another, as well as to external nature ; and then we can calculate or forecast far better the changes to which they may be subjected. The more of such knowledge we possess, the more accurately can we estimate the continuance or prospect of life.

2d. LONG-LIVED ANCESTRY.—All writers upon Life Insurance lay great stress upon inheritance, or a long-lived ancestry. This has been found by universal experience to be one of the prerequisites, in fact, an indispensable condition of long life. Now, why—why is this so important ? What are the reasons—what does it mean ? What is the rationale of it, or what lessons does it teach ? Does it not clearly and distinctly imply, that if there is any truth in this power of inherited organization for long life—the more perfect the organization the greater the power—there must certainly be found, somewhere in nature, a great general law of longevity ? The influences of hereditary descent have as yet received but little attention, compared with their importance, even by the medical profession, and before they can ever be thoroughly understood, it will be found, if we mistake not, that there exists in physiology, as a fundamental principle, a general law of propagation, and as a part and parcel of the same, will also be found this law of longevity. In the matter of

life insurance, a thorough knowledge of these hereditary influences is of the utmost importance.

3d. CONDITIONS OF HEALTH.—Obedience to law. This has a very wide application, including all the physical laws, and relations of body and mind. The better these laws and relations are understood, and the more strictly all are observed, the greater will be the amount of health, and the longer human life. But in order to effect this most successfully, the conditions of good health must first be fully understood, such as pure air and water, wholesome diet and drink, healthy vocation and residence, regular hours of exercise and sleep, temperate habits, right mental and moral culture, with a cheerful, contented disposition.

With the increased knowledge and observance of these laws of health, many individuals have not only prolonged their own lives, but the average duration of human life, within forty or fifty years, has considerably advanced. But physiology in its practical applications is yet in its infancy. When its principles become so generally understood and appreciated as to be practically applied throughout the community, in every family, and by every individual, then will be found a great diminution of disease, as well as of early mortality. Now, by having a true standard of organization for testing a good constitution, and by understanding correctly the laws of hereditary descent, it gives us new and more definite views of the various conditions of health. In the examination of persons for life insurance, all these laws or conditions must be taken into account, and after careful and thorough investigation, it will finally be found that all these principles and agencies operate in harmony with, and are based upon, one great general law in nature—the law of longevity.

The question may still be asked, wherein, how, or in what way more in detail, can this law be made practical? To answer this question fully would require a volume. Only two or three further suggestions can here be offered.

It points out directly the true means or sources of health and life,—that there is no chance or mystery in them, but

that they are all governed by laws which can be understood and obeyed. It expounds correctly the great laws of inheritance which furnish the ground-work—the prerequisites for good health and long life. It explains the absolute necessity in the outset of a sound constitution, of a well-balanced organization. It shows the relation and importance which human agency holds in propagating a sound and healthy stock. It teaches every individual more clearly what are the peculiarities and weaknesses of his own constitution, as well as what are his particular dangers or liabilities to disease. It is this exact, this definite, and personal knowledge that may be turned to the greatest account in the prevention of disease. If every individual in the community could be thus made acquainted with his own physiology, together with the laws of hygiene, we should soon see a most surprising difference in the relative amount of sickness as well as of early mortality. And who can appreciate the advantages of such a law, or make so good an application of it, as the well-educated physician, whether he be in private practice or holds some official position before the public ?

# THE SANITARIAN.

## A MONTHLY JOURNAL.

The purpose of this publication is to so present the results of the various inquiries which have been, and which may hereafter be made for the preservation of health and the expectations of human life, as to make them most advantageous to the public and to the medical profession.

The resources of sanitary science are inexhaustible. It will be a chief object of the SANITARIAN to awaken public attention to the extent of the field, and to the facts indicating how beneficially it may be cultivated. This will be done by showing the amount of ill health and mortality from preventable causes of disease; by pointing out the nature of those causes, and the way in which they operate, by showing that such causes are removable; and by exhibiting improved health, longevity and happiness as the fruits of their removal.

The laws of physiology and general pathology will be kept in view, as the basis of health; and by which hygiene constitutes a department of science which the medical profession can advantageously share with the public, or apply to individuals according to circumstances. The detail of these relations will involve questions of manifold significance, and many of them of the utmost importance to human health.

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A. N. BELL, M.D., *Editor*.

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